

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for cleaning one or more membranes normally immersed in water containing solids and used to produce a filtered permeate comprising:

(A) ~~performing recovery~~first cleanings to increase the permeability of the membranes from time to time; and,

(B) ~~between recovery cleanings~~the first cleanings, performing one or more cleaning events per week, each cleaning event having the steps of:

(a) stopping permeation;

(b) flowing a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a period of time; and,

(c) resuming permeation,

wherein

(i) each of the one or more cleaning events has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the period of time;

(ii) the one or more cleaning events has a weekly CT which is equal to the sum of the CT's of the one or more cleaning events performed in a week and is between 2,000 minutes•mg/L and 30,000 minutes•mg/L; and,

(iii) the cleaning events reduce the rate of decline in permeability of the membranes ~~between the recovery cleanings~~first cleanings; and,

(iv) the first cleanings are more intensive than the cleaning events.

2. (Previously Presented) The method of claim 1 wherein the weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

3. (Previously Presented) The method of claim 1 wherein the permeate is intended for drinking water and the weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

4. (Previously Presented) The method of claim 1 wherein the water containing solids is a wastewater and the weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

5. (Currently Amended) A method of cleaning one or more membranes normally immersed in water containing solids in a tank and used to produce a filtered permeate comprising:

performing cleaning events having the steps of:

(a) stopping permeation;

~~(b) after step (a), performing a pulse step in which a pump is operated to flow a chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membranes to provide cleaning chemical in an area in or adjacent the membranes;;~~

~~—— (c) after step (b), turning the pump off to provide a waiting period during which the chemical cleaner cleans the membranes;~~

~~(d) repeating steps (b) and (c); and,~~

(b) after step (a), and before resuming permeation, flowing a chemical cleaner through the membranes, in a direction opposite to the direction in which permeate passes through the membranes, in a series of pulses, wherein the pulses are separated from each other by waiting periods in which the flow of chemical cleaner is stopped;

(ce) after step (b), resuming permeation;

wherein

(df) the membranes remain immersed in the water containing solids while the chemical cleaner flows through the membranes; and,

(eg) the outside of the membranes is in fluid communication with the water containing solids.

6. (Currently Amended) The method of claim 5 wherein the cleaning events are repeated between 1 and 7 times per week between more intensive first cleanings performed at least 15 days apart to increase the permeability of the membranes.

7. (Previously Presented) The method of claim 6 wherein

(i) each cleaning event has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the time during which the chemical cleaner remains effective in the area adjacent the membranes; and,

(ii) the cleaning events have a weekly CT which is equal to the sum of the CT's of the one or more cleaning events performed in a week and is between 2,000 minutes•mg/L and 30,000 minutes•mg/L;

8. (Previously Presented) The method of claim 7 wherein the weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

9. (Previously Presented) The method of claim 6 wherein the permeate is intended for drinking water and the weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

10. (Previously Presented) The method of claim 6 wherein the water containing solids is a wastewater and the weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

11. (Previously Presented) The method of claim 5 wherein the pulse steps last for between 10 seconds and 100 seconds and the waiting periods last for between 50 seconds and 6 minutes.

12. (Previously Presented) The method of claim 5 wherein the pulse steps last for between 10 seconds and 100 seconds and the waiting periods last for between 50 seconds and 3 minutes.

13. (Previously Presented) The method of claim 5 wherein the length of the pulse steps is selected to provide chemical cleaner in an area in and adjacent to the membranes with an initial efficacy and the length of the waiting periods is selected to provide substantially effective chemical cleaner in an area in and adjacent to the membranes during the waiting period.

14. (Previously Presented) The method of claim 5 wherein the membranes are hollow fibre membranes and the pressure of the cleaning chemical in the pulse steps is between 5 kPa and 55 kPa above the pressure on the outside of the membranes.

15. (Currently Amended) The method of claim 14 wherein the flow through the membranes during the pulse steps is between 8.5 and 51 L/m²/h/bar.

16. (Original) The method of claim 5 wherein chemical cleaner is removed from the tank as retentate before permeation is resumed.

17. (Previously Presented) The method of claim 16 wherein substantially all of the chemical cleaner is removed from the tank as retentate before permeation is resumed.

Claims 18-26 (Cancelled)

27. (Currently Amended) A method for cleaning one or more membranes normally immersed in water containing solids and used to produce a filtered permeate comprising:

(A) performing ~~recovery~~first cleanings to increase the permeability of the membranes from time to time, the ~~recovery~~first cleanings being at least 15 days apart from each other; and,

(B) between ~~recovery~~the first cleanings, performing cleaning events at least once a week, the cleaning events each having the steps of:

(a) stopping permeation;

(b) flowing a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a period of time; and,

(c) resuming permeation,

wherein

(i) the chemical cleaner in each cleaning event has a concentration between about 20 mg/L and about 200 mg/L when expressed as an equivalent concentration of NaOCl in cleaning efficacy;

(ii) the period of time of each cleaning event is between about 10 minutes and about 100 minutes;

(iii) each of the one or more cleaning events has a CT which is equal to (A) the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy multiplied by (B) the period of time; and,

(iv) the sum of the CT's of the one or more cleaning events performed in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.

28. (Previously Presented) The method of claim 27 wherein the sum of the weekly CT is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

29. (Previously Presented) The method of claim 27 wherein the permeate is intended for drinking water and the weekly CT is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

30. (Previously Presented) The method of claim 27 wherein the water containing solids is a wastewater and the weekly CT is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

31. (Previously Presented) The method of any of claims 27 through 30 wherein

- (a) the membranes remain immersed in the water containing solids while the chemical cleaner flows through the membranes;
- (b) the outside of the membranes is in fluid communication with the water containing solids; and,
- (c) the membranes are not agitated while the chemical cleaner is flowed through the membranes.

32. (Currently Amended) The method of claim 1 wherein the ~~recovery~~first cleanings are at least 15 days apart.

33. (Currently Amended) The method of claim 27 wherein the decrease in the permeability of the membranes between performances of steps (B) ~~(a)~~, ~~(b)~~ and ~~(c)~~ is at least as great as any increase in the permeability of the membranes after a performance of steps (B) ~~(a)~~, ~~(b)~~ and ~~(c)~~.

34. (Previously Presented) The method of claim 1 wherein the membranes are hollow fibre membranes.

35. (Previously Presented) The method of claim 1 wherein the membranes are immersed in the water in an open tank and are not agitated during step (B)(b) of claim 1.

36. (Previously Presented) The method of claim 1 wherein the step of flowing a chemical cleaner through the membranes further comprises the step of flowing water to the permeate sides of the membranes and introducing a chemical cleaner to the flowing water.

37. (Previously Presented) The method of claim 1 wherein the cleaning events are performed at regular intervals and each have about the same CT.

38. (Previously Presented) The method of claim 1 wherein some or all of the water in the tank before step (B)(b) of claim 1 is replaced with feed water after step (B)(b) of claim 1.